



The University of North Carolina at Chapel Hill

GRADUATE STUDY IN COMPUTER SCIENCE



ANDREI STATE



LARRY KETCHUM

RESEARCH IN:

- Algorithms and Complexity Theory
- Computer Architectures
- Computer Graphics and Image Analysis
- Computer-Supported Cooperative Work
- Distributed Systems
- Geometric Modeling and Computation
- Hardware Systems and Design
- Human-Machine Interaction
- Hypertext
- The Monte Carlo Method
- Multimedia Systems
- Networking
- Parallel Computing
- Programming Language Design and Implementation
- Real-Time Systems
- Software Engineering and Environments
- Theorem Proving and Term Rewriting

JOIN US:

- M.S. and Ph.D. degree programs
- Award-winning faculty
- Consistently ranked as outstanding in national surveys (first in user interaction graphics in current U.S. News & World Report* survey of graduate programs and specialty areas)
- Opportunities to work on ground-breaking research
- Assistantships available to all full-time students
- Well-funded research projects (approximately \$8 million in external funding each year)
- State-of-the-art research facilities
- Located in a scenic college town, near one of the largest high-tech research parks in the U.S.

Tele-Immersion at UNC-Chapel Hill: Let's Get Together

For almost twenty years, our researchers in the Department of Computer Science at UNC-Chapel Hill (UNC) have dreamed of high-fidelity, life-sized, three-dimensional tele-collaboration that will enable us to see and hear our collaborators in remote locations as clearly as if they were sitting across the table from us. We seek a sense of presence—or immersion—with one another that is so strong it feels as if we are together in the same physical location. The sketch (above left) presents our vision of what this future environment might look like. The challenges to achieving our goal are enormous and involve technical trade-offs in computer vision (image-based sampling and 3D reconstruction), network transmission (quality-of-service and congestion control), and computer graphics (rendering and display).

In summer 2000, together with our National Tele-Immersion Initiative (NTII) partners at the University of Pennsylvania (UPenn) and Advanced Network and Services (ANS) we completed and demonstrated an unprecedented proof-of-concept, distributed, tele-immersive system. The system operates between UNC in

Chapel Hill, N.C., UPenn in Philadelphia, Pa., and ANS in Armonk, N.Y.

The photograph (above) depicts one of several recent experiments. Sitting in our department's Graphics and Image Lab, graduate student Ruigang Yang uses the system to communicate with Amela Sadagic at ANS in New York, and fellow graduate student David Gotz in another UNC lab. We created the 3D backgrounds of the remote sites from high-fidelity samples of a real environment that were obtained off line using our own scanning laser range finder system. We collected more than 20 million samples and transformed them to approximately 30 thousand triangles and 48 megabytes of associated color texture for rendering. The remote participants are rendered from dynamic 3D reconstructions using remote cameras and real-time computer vision techniques. Although these reconstructions are lower fidelity than the backgrounds, they are generated on line at interactive rates (1–2 updates per second) and are continually transmitted over Internet2 between the different sites.

NTII is led by chief scientist Jaron Lanier of ANS, Kostas Daniilidis of UPenn, Andries van Dam of Brown University, and Henry Fuchs of UNC. Other major participants in the research featured here are Amela Sadagic of ANS; Jane Mulligan of UPenn; and a team at UNC led by Fuchs, Gregory F. Welch, Herman Towles, and Kevin Jeffay. The UNC team includes a number of graduate students and a staff of research and technical people. UNC also collaborates with Brown University, as part of the NTII, and with both Brown and the University of Utah on telecollaboration research, as part of the National Science Foundation's Science and Technology Center for Graphics and Visualization. Principal current support comes from ANS and NSF. Additional support for related research and equipment has been provided by the Defense Advanced Research Projects Agency, the U.S. Department of Energy, and Intel Corp.

For more information:

- www.cs.unc.edu/Research/stc/office/
- www.advanced.org/teleimmersion.html
- www.cs.unc.edu/Research/Graphics-Image/

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*www.usnews.com/usnews/edu/beyond/gradrank/gbcomsp3.htm